Self-sustaining energy for remote locations

April 11, 2019

Imagine an electrical power plant small enough to be delivered by truck, simple enough to be fully operational in a few days, but able to power a small town for a decade or more without refueling.

It can provide electricity to remote communities, hardware installations, and deployed military bases. It can protect critical infrastructure like hospitals from reliance on the electrical grid.

It might be available soon to the places that need it. But where does it come from? Mars.

Kilopower to Megapower

Working in partnership with NASA, Los Alamos National Laboratory scientists recently unveiled Kilopower: a small, fully automated nuclear power plant designed to operate continuously for decades on deep-space craft, on the moon, or on Mars—providing abundant and secure power for human exploration or colonization.

Because Kilopower was already designed to work safely and reliably in an exceedingly hostile and remote environment, it was a natural model for safe, reliable, and especially portable power for sensitive or remote locales here at home.

Thus, Megapower was born. Like its space-worthy predecessor, Megapower employs an entirely new kind of nuclear reactor, in which several pieces of specially arranged solid uranium undergo a fission chain reaction.

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The reaction generates heat, and that heat is delivered to an engine by another Los Alamos invention called a heat pipe. Whenever more power is needed, the heat pipe draws heat faster, cooling the reactor and therefore slightly shrinking the uranium and increasing the reaction rate; in this way, the reactor automatically increases power when it’s needed and, conversely, cuts power when it’s not.

Since Megapower is designed to sacrifice economy of scale in favor of versatility and reliability, the electricity would be somewhat more expensive than typical grid-based power. Therefore, the technology would be better suited for isolated and specialized applications requiring significant uninterrupted power than for existing grid-connected cities.

The Laboratory team is currently maturing designs, testing materials, and exploring manufacturing options, with component and systems testing not far behind. If all goes according to plan, then anyone looking to retire off-grid with ten thousand households' worth of stable, automated power (and, not for nothing, a security perimeter suitable for safeguarding uranium) could see the ideal technology come online in as little as five years.

> Learn more about this project in the Laboratory's science magazine, 1663